

# Closing the Loop between Understanding and Effective Treatment of the Basal Ganglia and their Disorders

<https://neurodegenerationresearch.eu/survey/closing-the-loop-between-understanding-and-effective-treatment-of-the-basal-ganglia-and-their-disorders/>

## **Principal Investigators**

### **Institution**

### **Contact information of lead PI**

### **Country**

European Commission

## **Title of project or programme**

Closing the Loop between Understanding and Effective Treatment of the Basal Ganglia and their Disorders

## **Source of funding information**

European Commission FP7-Seventh Framework Programme

## **Total sum awarded (Euro)**

€ 2,476,922

## **Start date of award**

01/12/2013

## **Total duration of award in years**

5.0

## **The project/programme is most relevant to:**

Parkinson's disease & PD-related disorders

## **Keywords**

### **Research Abstract**

In this project, the basal ganglia are defined as actor-critic reinforcement learning networks that aim at an optimal tradeoff between the maximization of future cumulative rewards and the minimization of the cost (the reinforcement driven multi objective optimization RDMOO model). This computational model will be tested by multiple neuron recordings in the major basal ganglia structures of monkeys engaged in a similar behavioral task. We will further validate the RMDOO computational model of the basal ganglia by extending our previous studies of neural activity in the MPTP primate model of Parkinson's disease to a primate model of central serotonin

depletion and emotional dysregulation disorders. The findings in the primate model of emotional dysregulation will then be compared to electrophysiological recordings carried out in human patients with treatment-resistant major depression and obsessive compulsive disorder during deep brain stimulation (DBS) procedures. I aim to find neural signatures (e.g., synchronous gamma oscillations in the actor part of the basal ganglia as predicted by the RMDOO model) characterizing these emotional disorders and to use them as triggers for closed loop adaptive DBS. Our working hypothesis holds that, as for the MPTP model of Parkinson's disease, closed loop DBS will lead to greater amelioration of the emotional deficits in serotonin depleted monkeys.

This project incorporates extensive collaborations with a team of neurosurgeons, neurologists, psychiatrists, and computer science/ neural network researchers. If successful, the findings will provide a firm understanding of the computational physiology of the basal ganglia networks and their disorders. Importantly, they will pave the way to better treatment of human patients with severe mental disorders.

### **Lay Summary**

**Further information available at:**

#### **Types:**

Investments > €500k

#### **Member States:**

European Commission

#### **Diseases:**

Parkinson's disease & PD-related disorders

#### **Years:**

2016

#### **Database Categories:**

N/A

#### **Database Tags:**

N/A